(12) UK Patent Application (19) GB (11) 2 350 257 (13) A

(43) Date of A Publication 22.11.2000

(21) Application No 9911441.5

(22) Date of Filing 17.05.1999

(51) INT CL[7]
H04Q 3/00 , H04L 29/06

(52) UK CL (Edition R)
H4K KTA
H4L LDSC L1H10

(56) Documents Cited
EP 0940961 A1 WO 99/29135 A1 WO 98/35526 A2

(58) Field of Search
UK CL (Edition Q) H4K KTA
INT CL[6] H04L 29/06 , H04Q 3/00
ONLINE: EPODOC,WPI

(71) Applicant(s)
Telefonaktiebolaget L M Ericsson
(Incorporated in Sweden)
S-126 25, Stockholm, Sweden

(72) Inventor(s)
Leslie Graf
Mark Hollis
Paul Hollis
Stephen Terrill
Christian Groves
Barry Dingle
Nebosja Dikic
David de Nicolo
Lars Kari
Sune Ramström
Juan Noguera-Rodriguez

(74) Agent and/or Address for Service
Marks & Clerk
4220 Nash Court, Oxford Business Park South,
OXFORD, OX4 2RU, United Kingdom

(54) Abstract Title
Capability negotiation in a telecommunications network

(57) Node A represents an originating signalling point to which a calling party is connected whilst node C represents a terminating signalling point to which a called party is connected. Each of the signalling points comprises a call control level and a bearer control level. The bearer control level, comprising a bearer network such as an Internet Protocol (IP) network or an ATM network. When a calling party initiates a call, the originating signalling point generates a list of possible options relating to the capabilities of the originating signalling point which must be negotiated with the terminating signalling point node C. Node A sends a message to node C specifying the list of options in order of preference. Node C selects the preferred option and signals its choice to node A. Capabilities which may be negotiated in this way include the choice of a suitable speech codec for the call or security capabilities such as voice ciphering or data encryption.

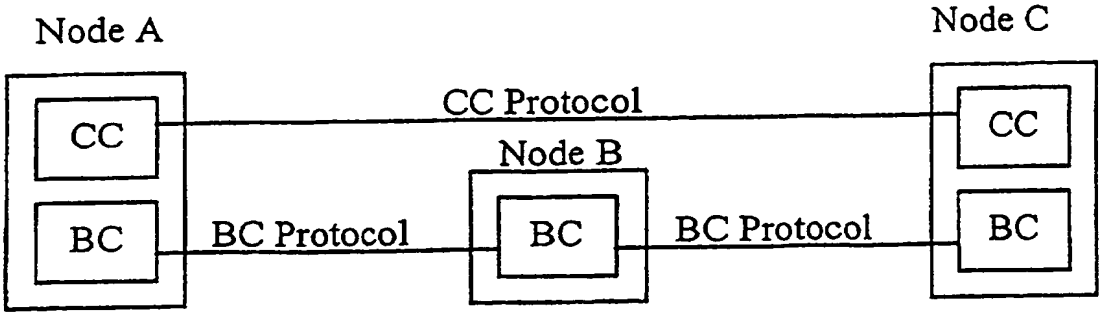

Figure 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

GB 2 350 257 A

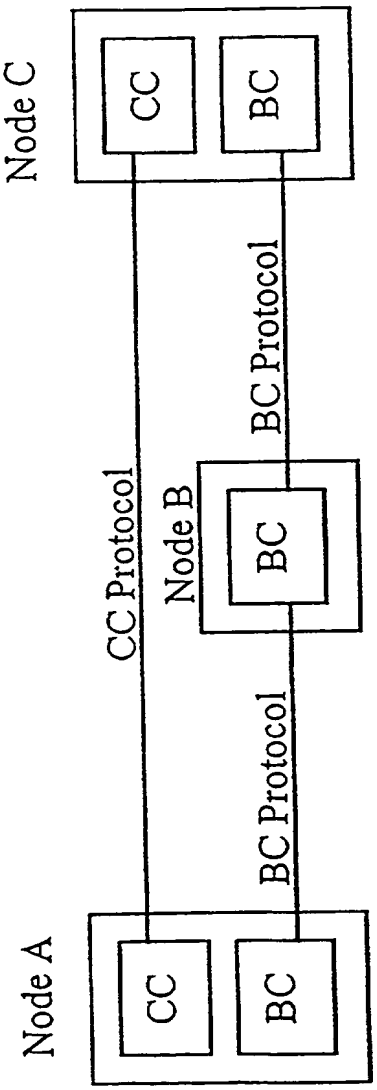

Figure 1

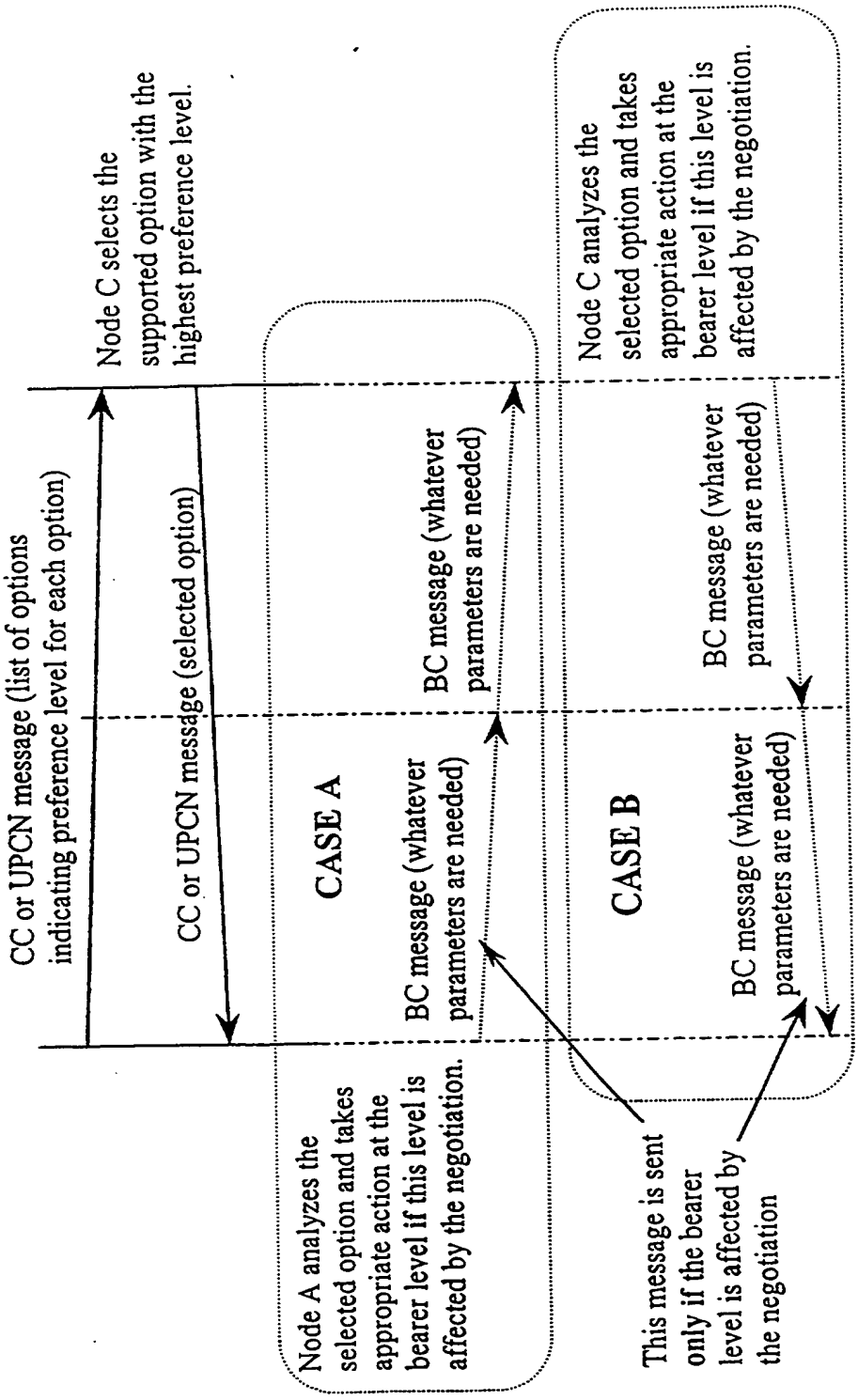

Figure 2

CAPABILITY NEGOTIATION IN A TELECOMMUNICATIONS NETWORK

Field of the Invention

The present invention relates to capability negotiation in a telecommunications network and in particular, though not necessarily, to the negotiation of a suitable speech codec.

Background to the invention

Telecommunications networks currently rely to a large extent upon the Signalling System no.7 (SS7) as the mechanism for controlling call connections and for handling the transfer of signalling information between signalling points of the networks. Typically, one or more application and user parts at a given signalling point will make use of SS7 to communicate with peer application and user parts at some other signalling point. Examples of user parts are ISUP (ISDN User Part) and TUP (Telephony User Part) whilst examples of application parts are INAP (Intelligent Network Application Part) and MAP (Mobile Application Part). The conventional SS7 protocol stack includes Message Transfer Parts MTP1, MTP2, and MTP3 which handle the formatting of signalling messages for transport over the physical layer as well as various routing functions.

There has been considerable interest of late amongst the telecommunications community in using non-standard (i.e. non-conventional within the telecommunications industry) signalling transport mechanisms in telecommunications networks in place of the conventional SS7 mechanisms. The reasons for this are related both to improvements in efficiency as well as potential cost savings. Much consideration has been given for example to the use of Internet Protocol (IP) networks to transport signalling information between signalling points. IP networks have the advantage that they make efficient use of transmission resources by using packet switching and are relatively low in cost due to the widespread use of the technology (as opposed to

specialised telecommunication technology). There is also interest in using other transport mechanisms including AAL1/2/5, FR etc.

The standard ISUP which deals with the setting-up and control of call connections in a telecommunications network is closely linked to the SS7 signalling transport mechanism and does not readily lend itself to use with other non-standard transport technologies such as IP and AAL2. As such, several standardisation bodies including the ITU-T, ETSI, and ANSI, are currently considering the specification of a signalling protocol for the control of calls, which is independent of the underlying transport mechanism. This can be viewed as separating out from the protocol bearer control functions which relate merely to establishing the parameters (including the start and end points) of the "pipe" via which user plane data is transported between nodes, and which are specific to the transport mechanism. The new protocol, referred to as Transport Independent Call Control (TICC), retains call control functions such as the services invoked for a call between given calling and called parties (e.g. call forwarding), and the overall routing of user plane data.

Traditionally, fixed telephone networks make use of Pulse Code Modulation to transport user plane data, e.g. voice, facsimile, etc, between network nodes. Modern cellular networks on the other hand often use one or more coders/decoders (referred to as "codecs") to compress voice signals for efficient transmission across the air interface and within the cellular networks themselves. Where a telephone call connection extends between two networks (or terminals) which support different or multiple speech codecs, a negotiation may be carried out between the terminals to decide upon an appropriate codec. If this negotiation is not carried out, the result may be a requirement for transcoding at the interface between the networks, i.e. conversion from one form of speech coding to another. Transcoding is expensive in terms of resources, significantly degrades speech quality, and introduces a processing time delay. Codec negotiation is therefore the preferred option.

In addition to codec negotiation, there is often a need in conventional telecommunications networks to negotiate other functionality and parameters. For

example, it may be desirable to negotiate security capabilities such as voice ciphering and data encryption between terminals or nodes in telecommunications networks.

Summary of the Present Invention.

The inventors of the present invention have recognised that it will be necessary to provide for capability negotiation(s) at the Call Control level in a telecommunications network.

According to a first aspect of the present invention there is provided a method of negotiating a call capability between signalling points in a telecommunications system, the method comprising:

sending a capability preference or prioritised list of preferences from an originating signalling point to a terminating signalling point or signalling transfer point, at the Call Control level; and

returning a capability acceptance from the terminating signalling point or signalling transfer point to the originating signalling point at the Call Control level, if the terminating signalling point or signalling transfer point accepts a preference sent by the originating signalling point.

It will be appreciated that in some cases, e.g. where the terminating signalling point or signalling transfer point does not accept a capability preference (or one of a list of preferences) sent by the originating signalling point, no acceptance message may be returned in which case a default capability is assumed by both points. Alternatively, a default message may be returned indicating that the default codec is to be used. If no codec can be agreed upon, then in certain situations a call may be released due to network incompatibility.

The present invention is particularly suited to negotiating speech codec capabilities between signalling transfer points located in different telecommunications networks. For example, in Japanese telecommunications networks, the invention may be used to negotiate the use of one of VSELP, PSI-CELP, or μ-law coding, where μ-law coding is

the default coding. However, the invention is also applicable to negotiating other capabilities including security capabilities (e.g. voice ciphering and data encryption).

The protocol used to conduct the negotiation may TICC, or may be a specific protocol also arranged at the CC level, i.e. a User Plane Capability Negotiation protocol.

Where the Call Control and Bearer Control levels are controlled by separate protocols, a signalling point reacts to the selection of a capability at the Call Control level by notifying the Bearer Control level, if the selection affects the bearer level. If appropriate, notifications may be subsequently sent at the bearer level between bearer switching points to enable the establishment of appropriate bearer level resources.

According to a second aspect of the present invention there is provided a signalling point arranged to negotiate a call capability with another signalling point in a telecommunications system, the method comprising:

means for sending a capability preference or prioritised list of preferences to a terminating signalling point or signalling transfer point, at the Call Control level; and

means for receiving a capability acceptance from the terminating signalling point or signalling transfer point at the Call Control level, which capability acceptance is sent if the terminating signalling point or signalling transfer point accepts a preference sent by the originating signalling point.

Brief Description of the Drawings

Figure 1 illustrates a number of signalling points in a telecommunications network; and

Figure 2 (case A) illustrates signalling flows between the signalling points of Figure 1 according to a first embodiment of the invention; and

Figure 2 (case B) illustrates signalling flows between the signalling points of Figure 1 according to a second embodiment of the invention.

Detailed Description of Certain Embodiments

There is illustrated in Figure 1 a portion of a telecommunications network comprising two signalling points referred to hereinafter as Nodes A and C. These node may be for example telephone exchanges or switches and may belong to the same network operator or to different network operators. In the present example, Node A is the originating node to which a calling party (not shown) is connected whilst Node C represents a terminating node to which a called party is connected. Each of the signalling points comprises a Call Control (CC) part and a Bearer Control (BC) part, i.e. the call control and bearer control functionalities are separated out into two distinct protocol layers. The CC parts form a Call Control level which is responsible for performing functions such as call forwarding as well as other routing and control functions. The BC parts are responsible for establishing and dimensioning pipes between BC parts for transporting user plane data.

Considering now the BC level, this comprises a bearer network which may be for example an IP network. Within the IP network there are one or more bearer switching points, although only one such point is illustrated in Figure 1 (Node B). For the IP network, these bearer switching points will be IP routers. It will be appreciated that where the bearer network is an ATM or AAL2 network the bearer switching points would be ATM or AAL2 switches respectively.

In the event that a calling party initiates a call, e.g. by taking his telephone off-hook, the originating signalling point Node A receives at the CC level information from the source (i.e. caller) which defines the bearer resource requirements. The originating signalling point determines, on the basis of the source information and/or the capabilities of the signalling point and its home network, a list of possible options which must be negotiated with the terminating signalling point Node C.

Node A then signals the list of possible options in a message to the CC part with which it wishes to negotiate a specific capability (node C in Figure 1). The message indicates the level of preference for each option.

Node C uses the priority levels specified by Node A for each option in the list to select the most preferred option that it supports, i.e. Node C does not choose an option if it supports another option in the list for which Node A has indicated a higher preference. Node C signals the selected option to Node A.

If the results of this negotiation affects the bearer connection level, appropriate actions are taken at the bearer level to adapt to the outcome of the negotiation. This is done by the BC protocol. Two cases are possible: forward bearer modification (case A in Figure 2) or backward bearer modification (case B in Figure 2).

An example of a capability which may be negotiated using the above method is codec capability. Generally, speech is transcended to PCM in the radio access network because this is the only speech format allowed by traditional fixed telephone networks. However, as transcoding significantly deteriorates the speech quality, some cellular standards (e.g. GSM, PDC) specify methods to avoid transcoding when a connection is established between two compatible terminals (e.g. two GSM terminals with a common codec). Since most current mobile terminals support several codecs, these methods also implement codec negotiation but have some important drawbacks compared to the generic negotiation mechanism presented here.

Speech codecs are either tightly coupled to mobile environments (in PDC, codec negotiation is a service of the Mobile Application Part –MAP- protocol) or do not optimise the use of hardware and transmission resources (in GSM, codec negotiation is part of the tandem free operation –TFO- protocol. Two transcoders and a 64Kbps channel are allocated always for a speech connection independently of whether transcoding actually happens or not). Currently, different mobile standards deal with the problem in different ways and there has previously been no possibility to harmonize solutions.

Another example of a capability which may require negotiation is security capabilities (voice ciphering, data encryption, etc.). This is currently of great interest in public

telecommunication networks and will become more so in the near future. However, there are multiple ways of protecting user plane information against unwanted observers. There are multiple ciphering algorithms and data encryption algorithms currently deployed and new ones appearing continuously. Therefore, a way to negotiate security capabilities in public telecommunication networks will be required shortly and this is provided by the present invention.

It will be appreciated by the person of skill in the art that various modifications may be made to the above described embodiments without departing from the scope of the present invention.

CLAIMS:

1. A method of negotiating a call capability between signalling points in a telecommunications system, the method comprising:

sending a capability preference or prioritised list of preferences from an originating signalling point to a terminating signalling point or signalling transfer point, at the Call Control level; and

returning a capability acceptance from the terminating signalling point or signalling transfer point to the originating signalling point at the Call Control level, if the terminating signalling point or signalling transfer point accepts a preference sent by the originating signalling point.

2. A method according to claim 1, wherein, when the terminating signalling point or signalling transfer point does not accept a capability preference or one of a list of preferences sent by the originating signalling point, no acceptance message is returned in which case a default capability is assumed by both points.

3. A method according to claim 1 or 2, wherein the capability negotiated relates to a speech codec.

4. A method according to claim 1 or 2, wherein the capability negotiated relates to security .

5. A method according to any one of the preceding claims, wherein the protocol used to conduct the negotiation is the Call Control protocol.

6. A method according to any one of the preceding claims, wherein the Call Control and Bearer Control levels are controlled by separate protocols, and a signalling point reacts to the selection of a capability at the Call Control level by notifying the Bearer Control level, if the selection affects the bearer level.

7. A signalling point arranged to negotiate a call capability with another signalling point in a telecommunications system, the method comprising:

means for sending a capability preference or prioritised list of preferences to a terminating signalling point or signalling transfer point, at the Call Control level; and

means for receiving a capability acceptance from the terminating signalling point or signalling transfer point at the Call Control level, which capability acceptance is sent if the terminating signalling point or signalling transfer point accepts a preference sent by the originating signalling point.

Application No: GB 9911441.5
Claims searched: 1-7

Examiner: Peter Slater
Date of search: 9 December 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H4K (KTA)

Int Cl (Ed.6): H04Q 3/00; H04L 29/06

Other: ONLINE: EPODOC , WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	EP 0940961 A1	(NOKIA) - see whole document	.1,7
X	WO 98/35526 A2	(ERICSSON) - see whole document	1,7
A,E	WO 99/29135 A1	(BRITISH TELECOM)	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

BNSDOCID: <GB___2350257A__I_>